



U.S. DEPARTMENT OF  
**ENERGY**

Legacy  
Management

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## 2018 Long-Term Stewardship Conference

# Managing Risk in the Uncertain World of Groundwater Cleanup

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Consolidated Nuclear Security, Pantex Plant

Track 2: Breakout Session 2.1 - Groundwater Compliance Challenges

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CNS

Tony Biggs  
CNS

Jeff Stovall  
Carrollo Engineering

Eric Sandifer  
CNS

# Pantex Plant - Background

## Active Mission

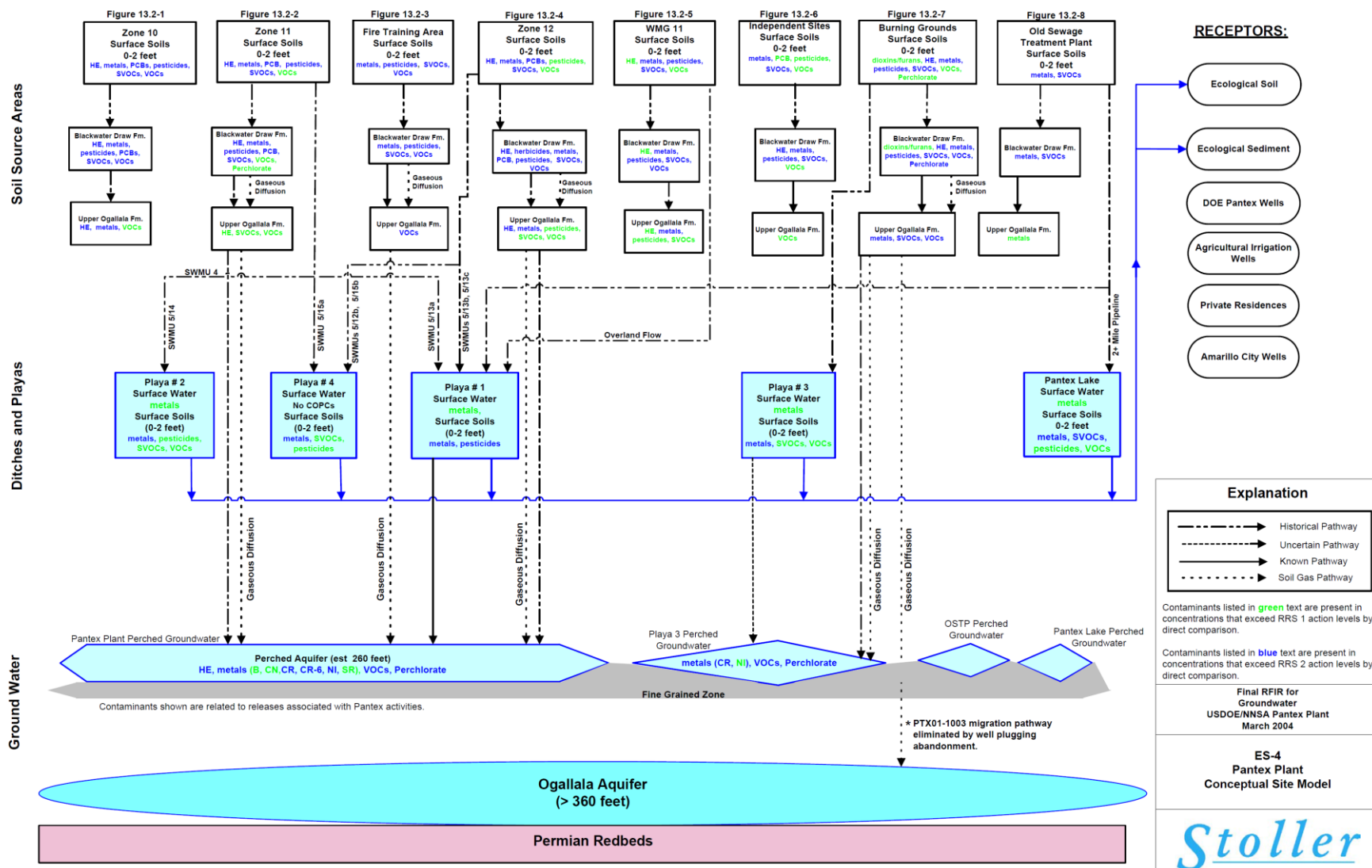
- Maintain the nuclear weapon stockpile via assembly, disassembly, and retrofit.
- Supported via the high explosives center of excellence.

## Environmental Background

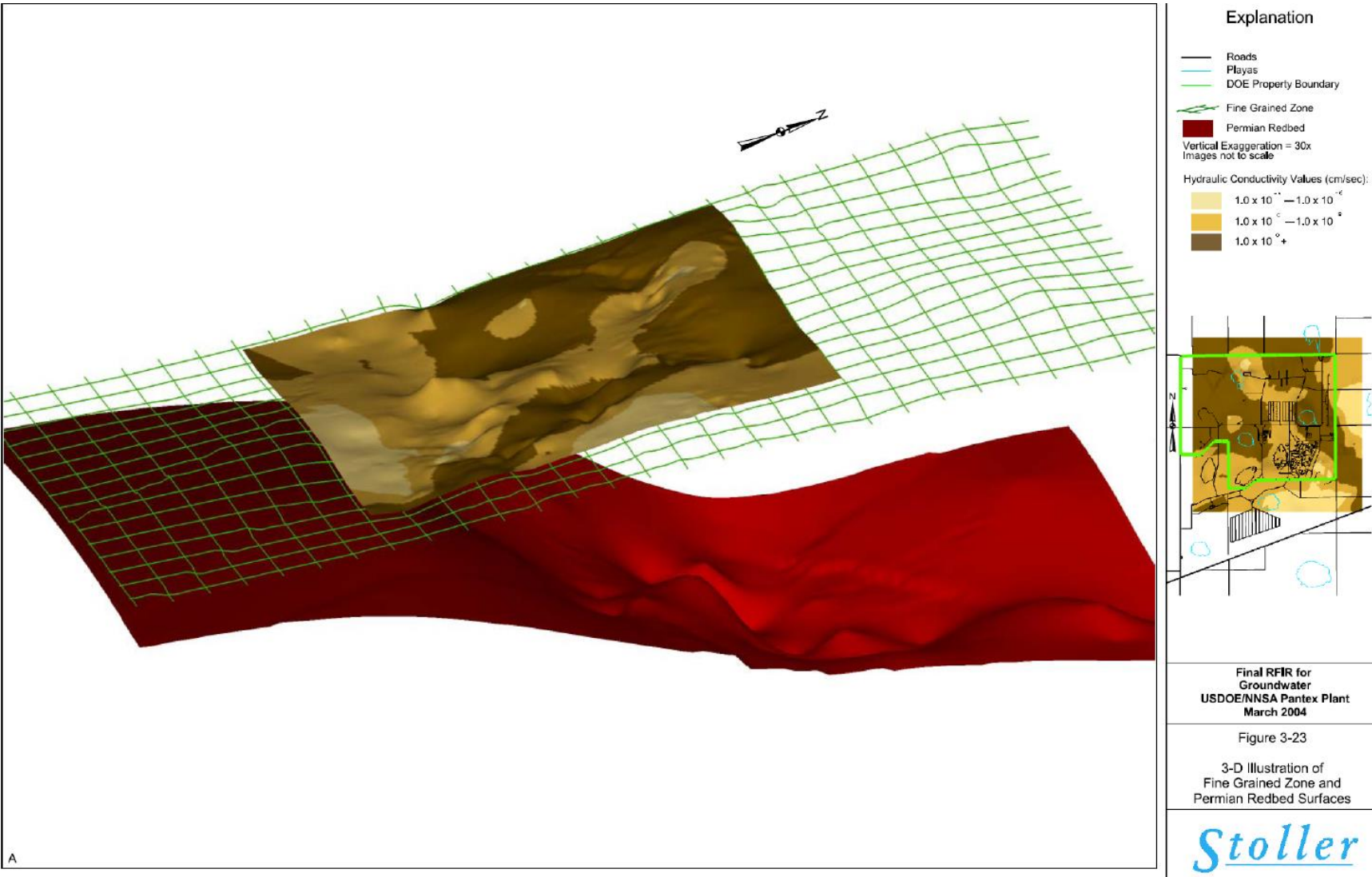
- 1989 – RCRA Facility Assessment/Visual Site Inspection conducted
- 1991 – RCRA Hazardous Waste Permit issued
- 1994 – Listed on the Superfund National Priority List
- 2001 – Core Team established consisting of DOE, TCEQ, EPA, and M&O contractor
- 2002 – Conceptual Site Model established
- 2003-2005 – Remedial Investigation completed and documented
- 2006-2007 – Human Health and Ecological Risk Assessments completed
- 2007 – Feasibility Study (FS) completed
- 2008 – FS approved/Proposed Plan developed/Record of Decision issued
- 2009 – Remedial Design/Construction Completion issued
- 2010 – Interim Remedial Action Report completed
- 2010 – LTS began
- 2013 – 1<sup>st</sup> Five-Year Review completed

# Generalized Source Migration Model

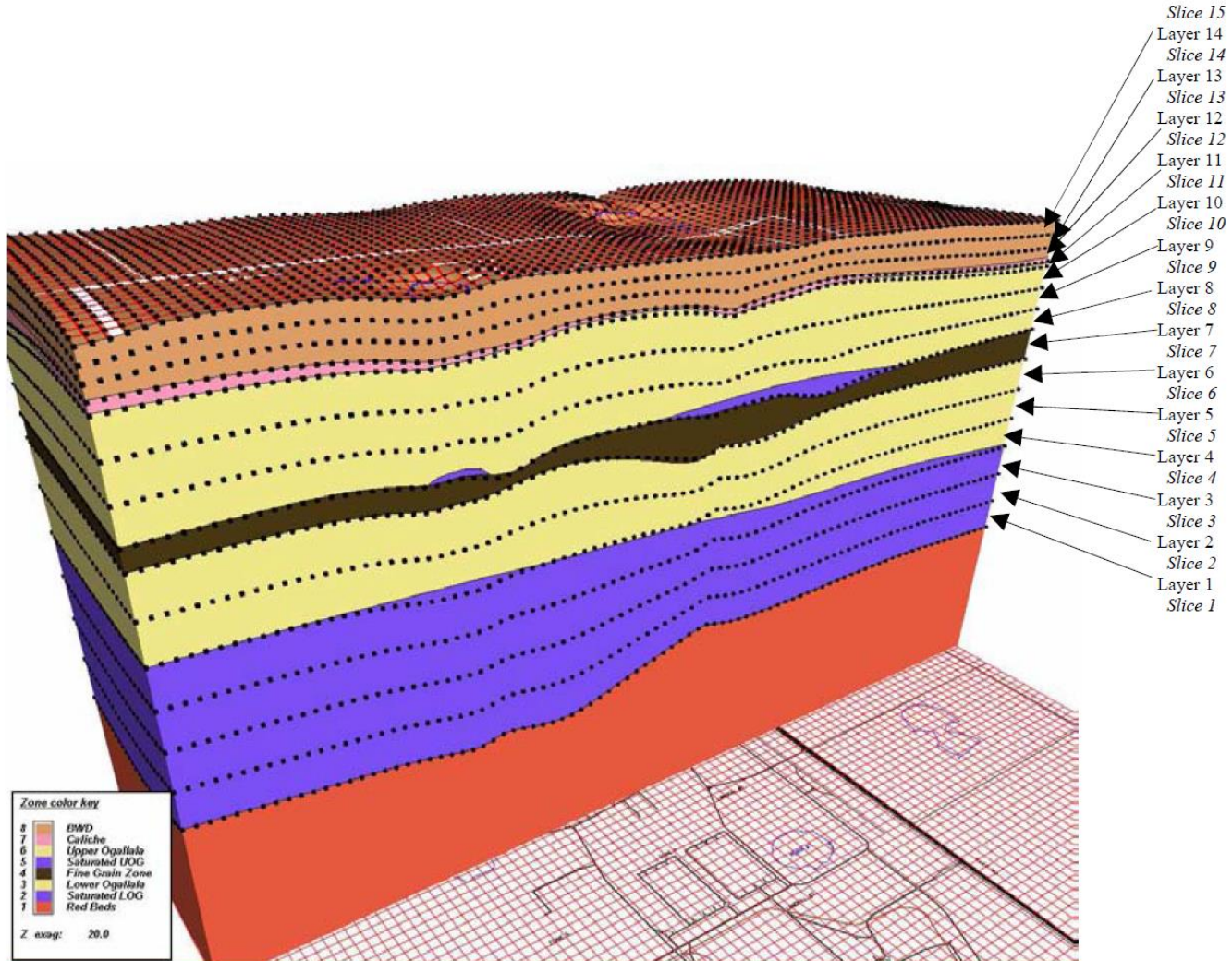
- Point of release to environmental media via cross-media migration



# 3D Illustration of FGZ and Permian Redbeds

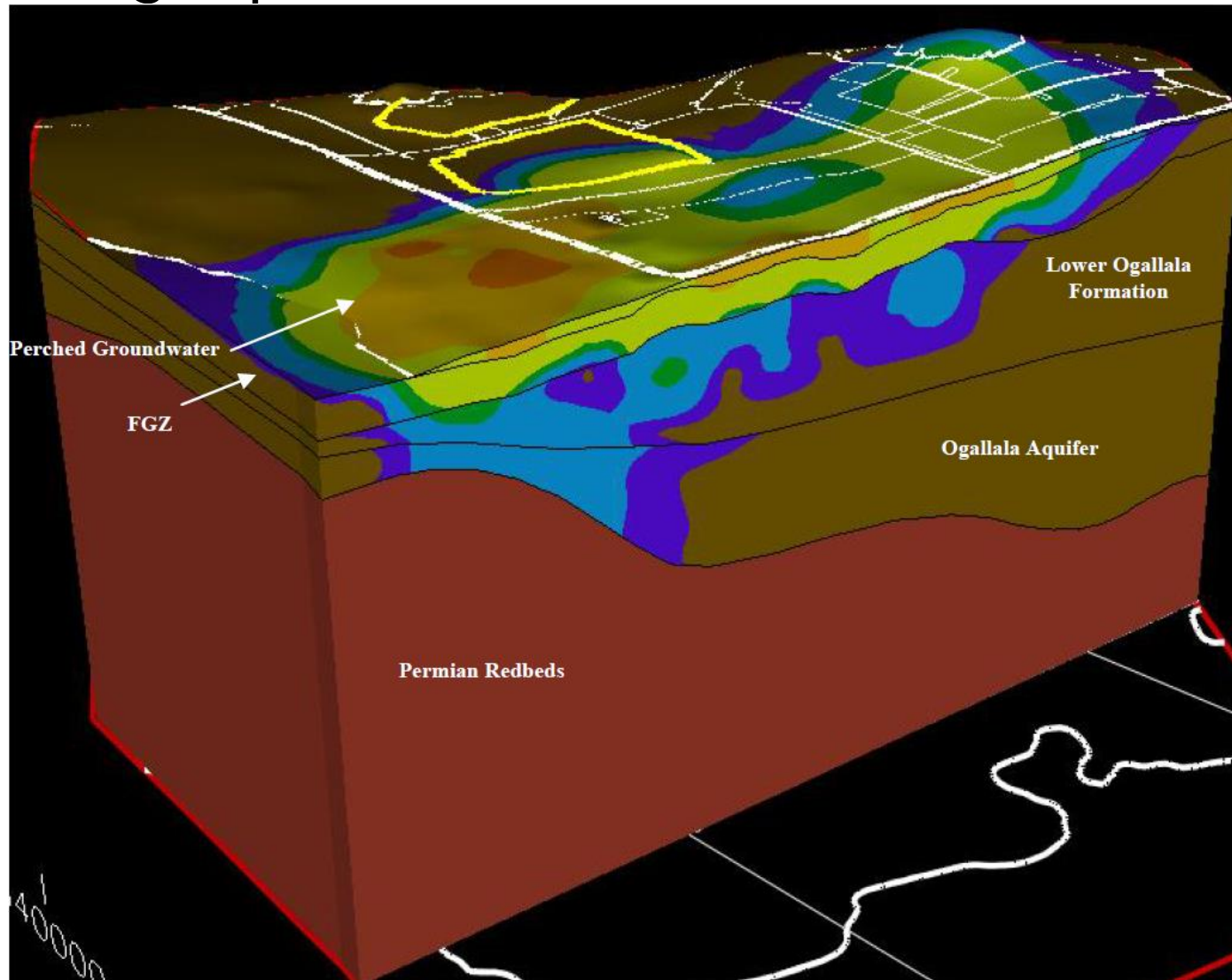


# Subsurface Conceptual Site Model

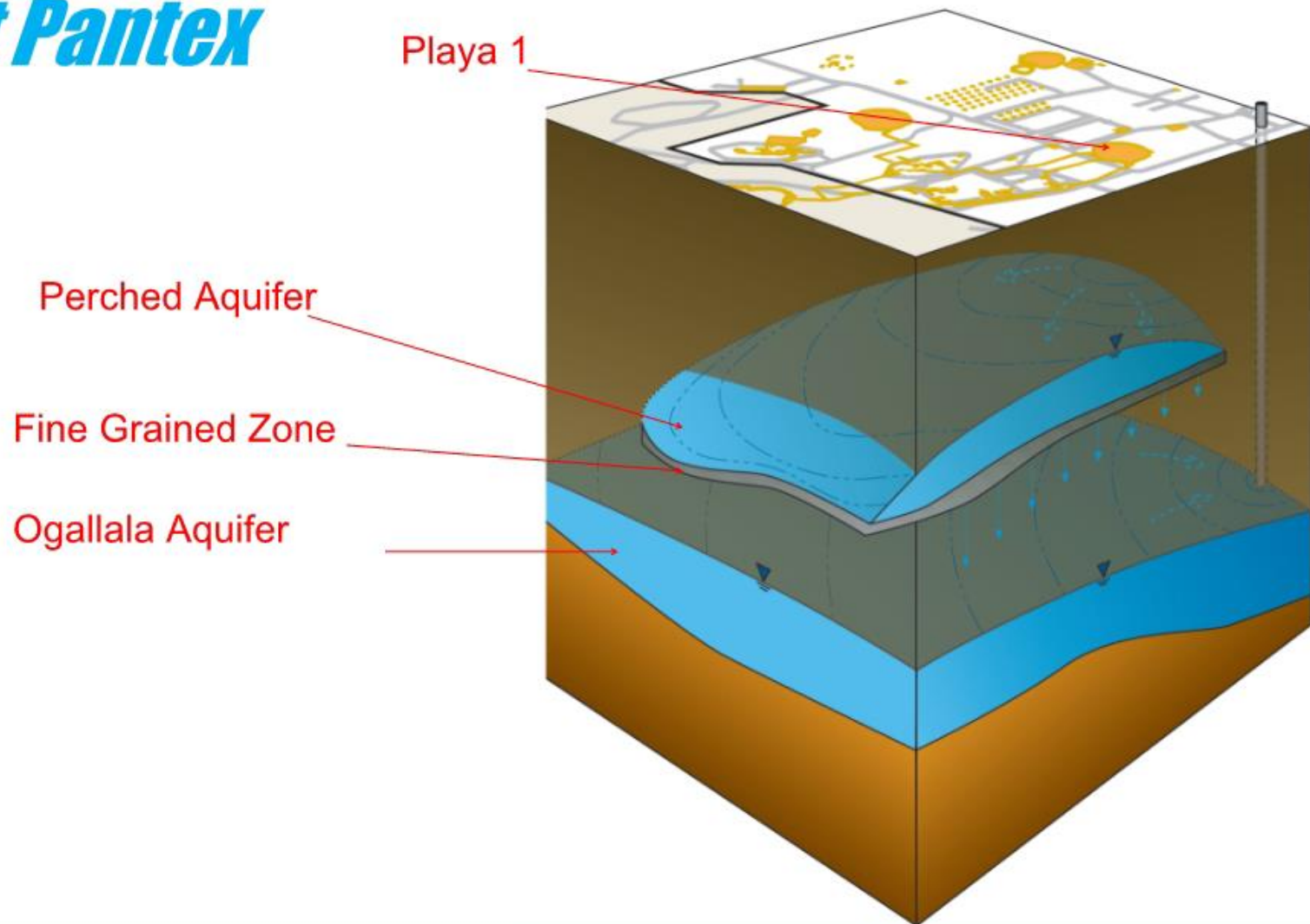




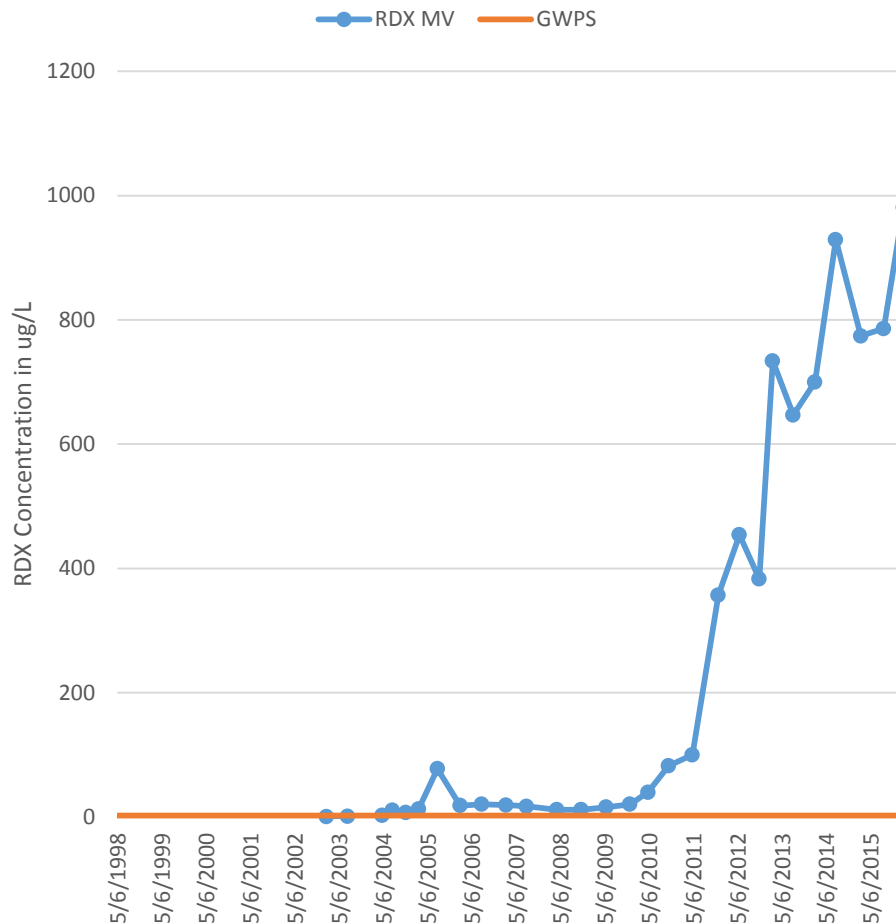
# Site Modeling Representation in Absence of Remedial Action



# *Groundwater Flow at Pantex*





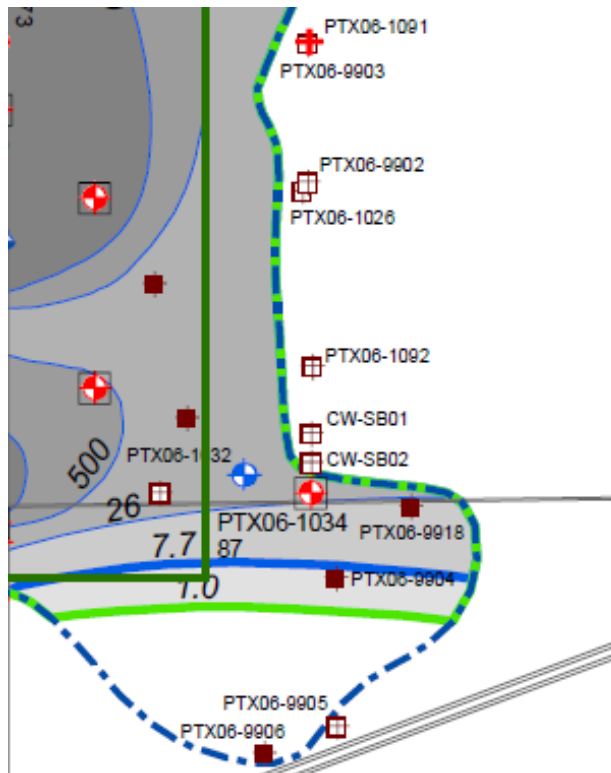


### Monitor Well PTX06-1034

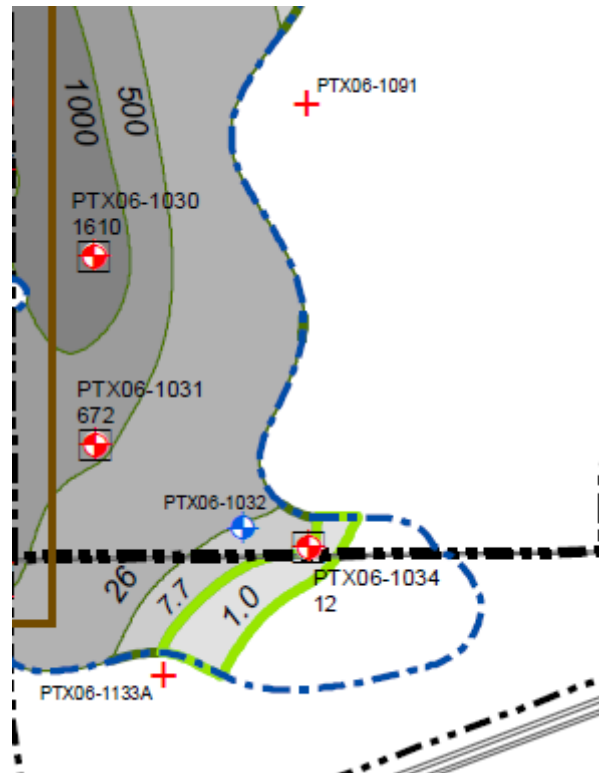
This well installed on a private landowner's property in 1998 was dry until 2002 and showed no significant concentration of RDX until 2012.

# RDX Plume Progression in Perched Groundwater

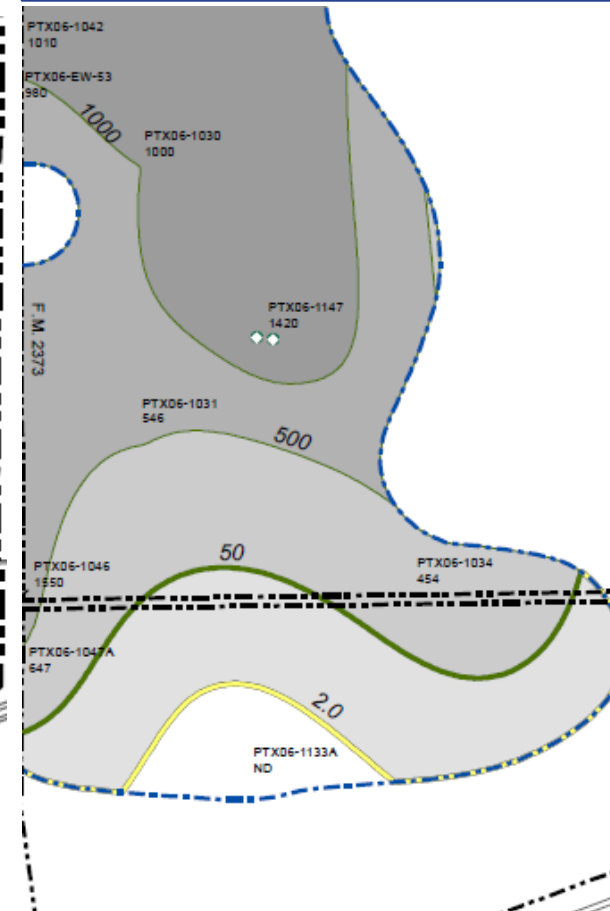
**2004**



**2008**

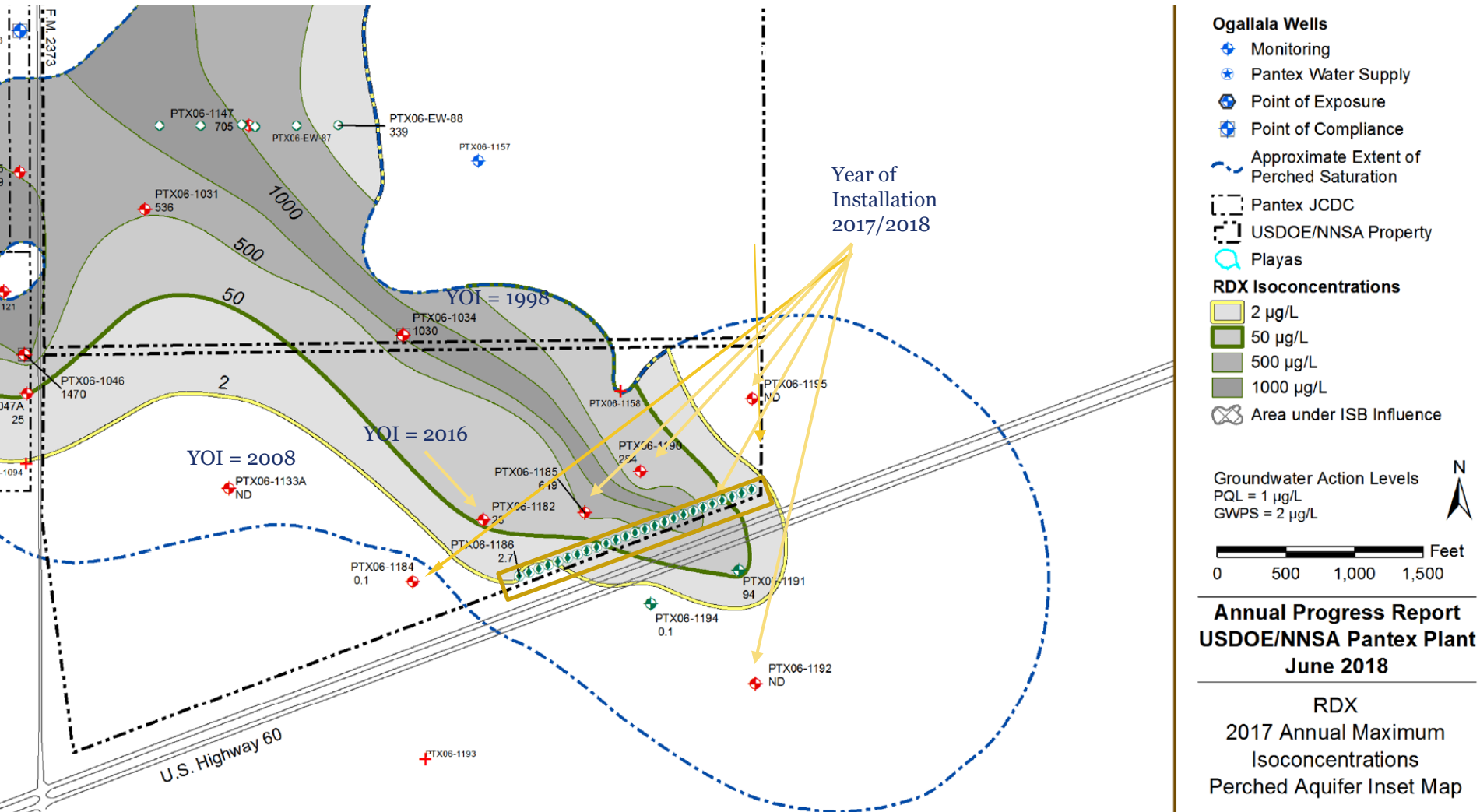


**2012**

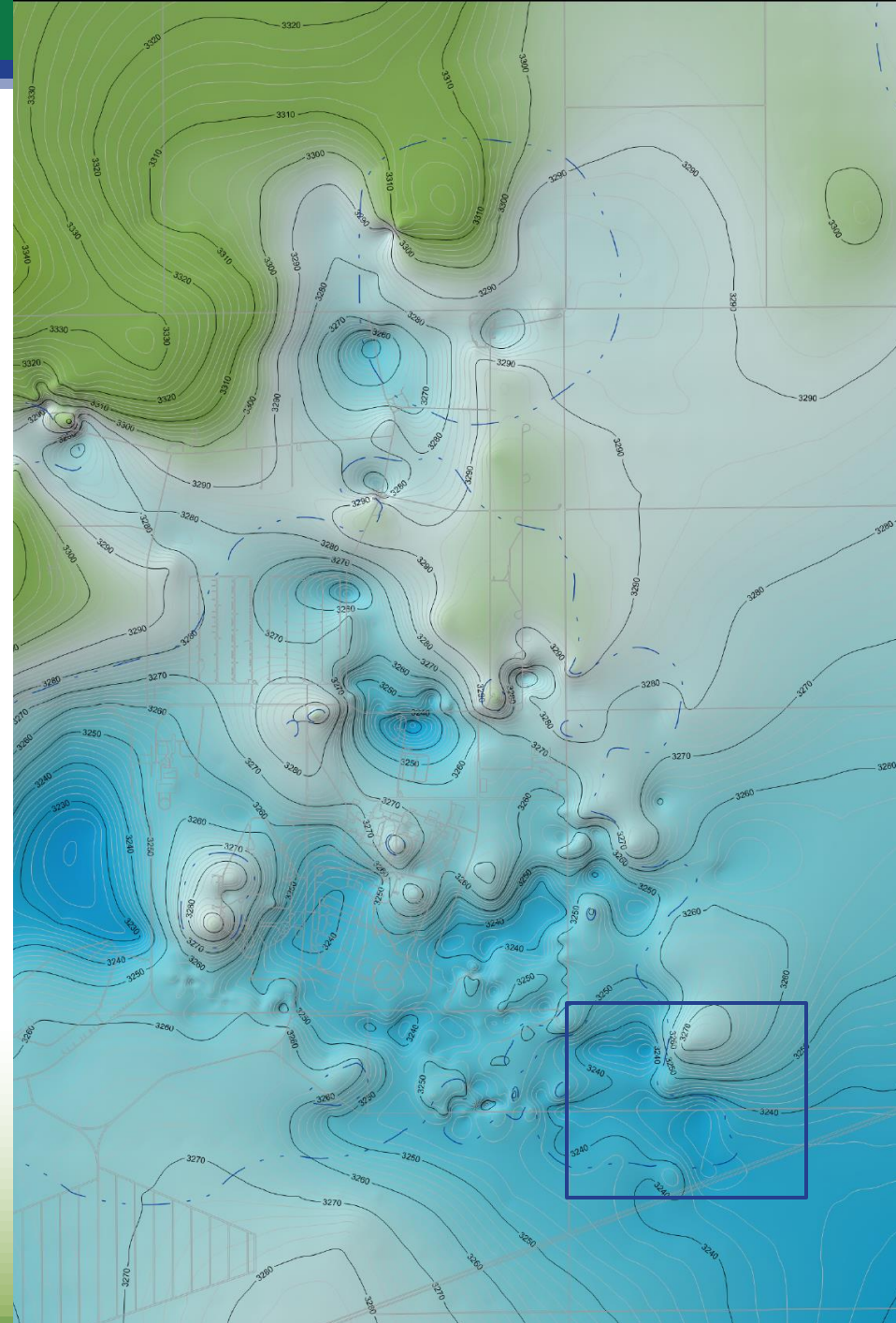


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# SE Lobe Perched GW Extent Map -2017



# Fine-Grained Zone Topography of SE Lobe



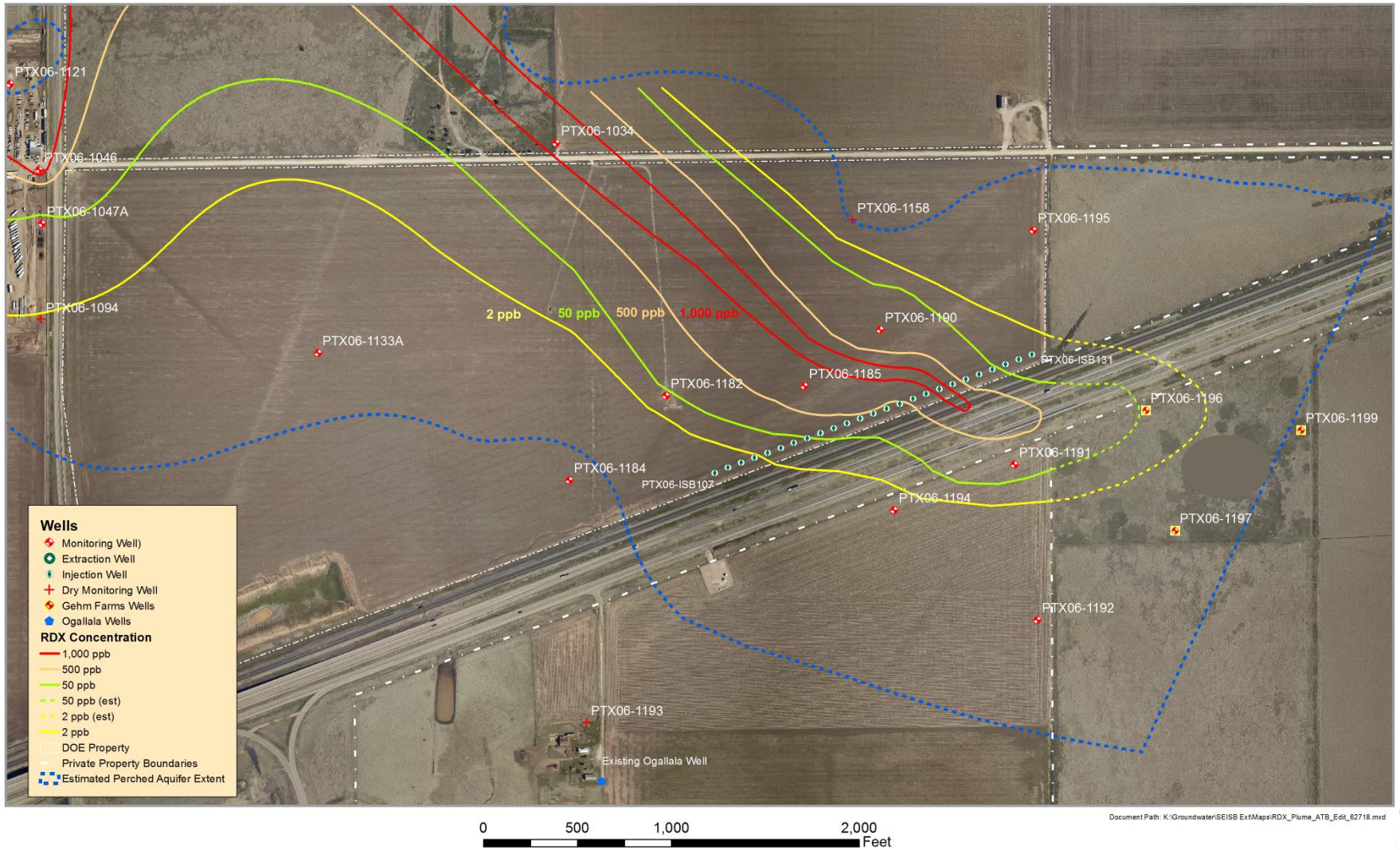


# Installation of ISB Injection Wells





## Southeast Lobe RDX Concentrations

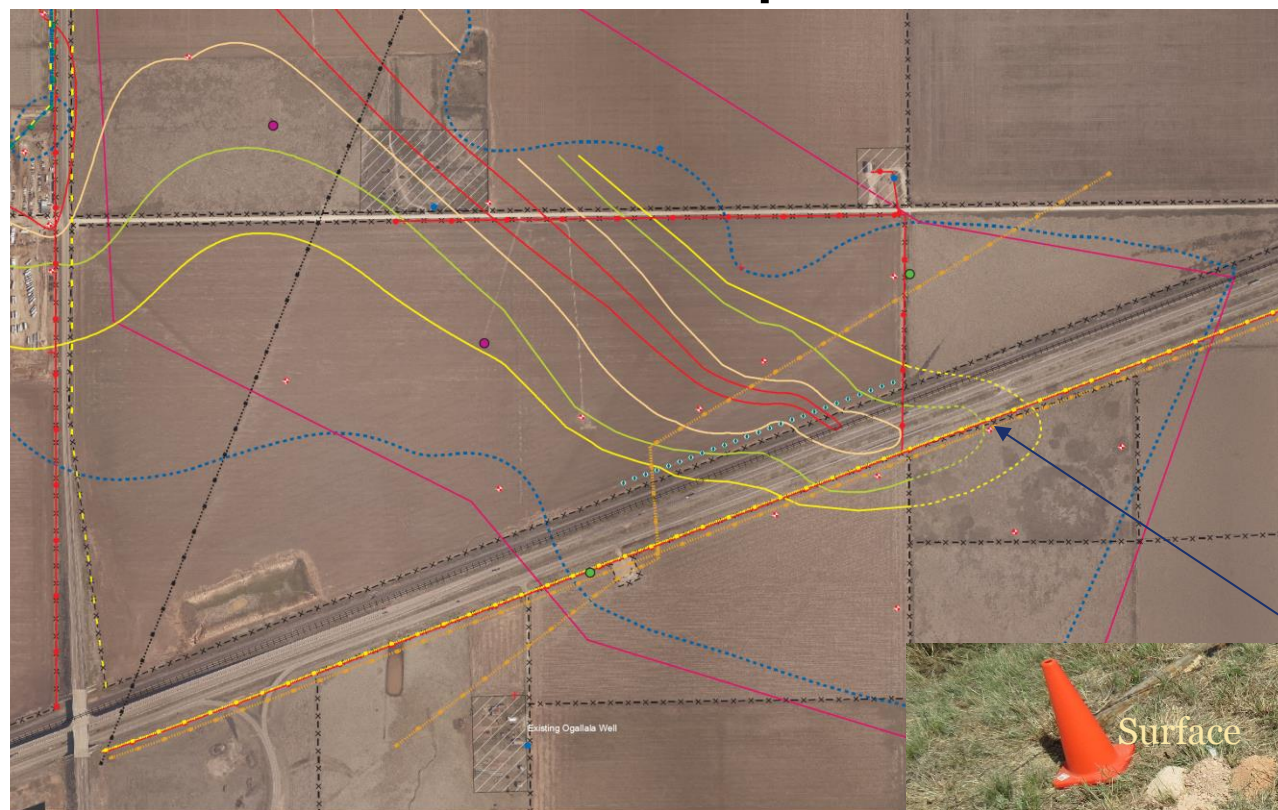


# RDX Plume Movement

- Vertical leakance into the aquitard/fine-grained zone (FGZ) is approaching equilibrium with horizontal flux (circa 2008).
- Overall horizontal expansion slowing, but southeast slope to FGZ will lead to slow future migration of the hotspots within the southeast perched groundwater plume (especially PTX06-1034 increasing trend starting in 2009).
- RDX plume movement at point of the 1<sup>st</sup> 5-Year Review (2013) led to follow-up actions of perched groundwater monitoring wells to improve evaluation of perched groundwater within the southeast lobe. PTX06-1082 installed in 2016 indicated the presence of more water than anticipated and RDX/DNT4A above ground water protection standards.
- Another perched groundwater monitoring well was installed in 2017 (PTX06-1185). RDX result of 649 ppb indicates a departure from the CSM.
- It appears that GW flow velocity may be an order of magnitude greater than anticipated. Braided alluvial stream channels are suspected.
- Reliance on assumptions used to develop the CSM almost allowed plume movement offsite without recognition in the southeast lobe of the perched.



# Future Work to Improve Understanding



0 500 1,000 2,000 Feet

Returns from PTX06-1196



# What Paradigm shift would prevent over-reliance on site CSMs?

- Open review of CSM with the purpose of risk identification, quantification, and mitigation strategy development.
  - Consider potential alternative migration mechanisms given the uncertainty within the CSM; pursue this with the purpose of defining probability of triggering a risk and understanding the consequences associated with it.
  - Review unexpected plume movement and data anomalies with the intent of understanding the plausible factors that could account for their observation and their associated consequences.
  - Evaluate the CSM with a fresh set of eyes by employing different techniques to analyze the lithological data; for example implement Environmental Sequence Stratigraphy (ESS) processes to identify potential pathways not previously recognized. (Reference body of work by Richard Cramer, Burns & McDonnell)
  - Acquire data to verify the assumptions in the CSM - Implement Passive Flux Meters to acquire flow velocity estimates that will aid in improving temporal understanding (refer to Track 1.2 presentation, Michelle Jarrett, CNS)
  - Conduct a current-induced electromagnetic survey to identify preferential flow paths (Willowstick Technologies) followed by strategic installation of wells to confirm the understanding gained and focus treatment.

# Questions

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